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TOMATO CULTURE

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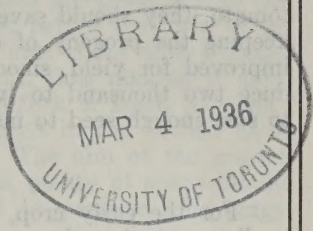
T. F. RITCHIE, B.S.A.

ASSISTANT IN VEGETABLE GARDENING

DIVISION OF HORTICULTURE
DOMINION EXPERIMENTAL FARMS

W. T. MACOUN, D.Sc.

Dominion Horticulturist



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TOMATO CULTURE

By T. F. Ritchie, B.S.A.

ASSISTANT IN VEGETABLE GARDENING

The production of tomatoes in Canada for general market, canning and home use has developed enormously during the past decade. It should be the aim of the grower to have the fruit ripen sufficiently early to insure a large yield per plant, thus obtaining much better returns than from a late crop. To insure having good stocky plants, eight to ten weeks should be allowed from seed sowing until they are planted in the open. In the warmer parts of Ontario, the seed is usually sown in a greenhouse during the month of February, and in the colder sections, the time may extend into April, but the average time of sowing is the month of March. If the seed is sown too early, the plants require a lot of handling and all this adds to the cost of production.

THE SEED

There are, at the present time, well selected strains of the leading varieties available, from the commercial seed houses, but it has been found that where growers are anxious to maintain a reputation for producing a known type of tomato, they should save seed each year from the desirable plants in the field, keeping the progeny of each plant separate. By selection, a variety may be improved for yield, smoothness and earliness. One ounce of seed should produce two thousand to two thousand, five hundred plants, but it is advisable to sow enough seed to insure a good stand.

VARIETIES

For the early crop, Alacrity and Earliana are without doubt two of the leading sorts, but there are also a number of strains of Earliana, under various names, that are quite good. Chalk Jewel, John Baer and Bonny Best can be relied upon as main crop varieties. June Pink is a pink Earliana type that is quite good, with Livingston Globe as a late pink.

THE SOIL

Prepared soil is by far the best. Sods from a sandy loam soil that have been piled the previous spring with a layer of good manure between the layers of sods will be found ideal. By the autumn, the whole mass of sod and manure will have rotted, forming a desirable rich compost. With a sharp spade, thin slices of this pile should be cut from the top to the bottom and thrown into a neat pile. Before winter sets in, the pile of soil should be again turned to insure having it in good fine condition. Sometimes it is found necessary to add clear river sand to the soil to insure good drainage.

SEED SOWING

It is customary to sow the seed thinly broadcast, or in drills, in flats, or boxes that are eleven by twenty-four inches, and containing three or four inches of soil. The bottoms of these flats should have at least six half-inch auger holes bored through to permit proper drainage, or heavy screen wire, five

mesh to the inch, may be used for the bottoms. After the seed has been sown, cover with one-quarter of an inch of soil and place the flats in the greenhouse or hotbed. Where small lots are to be started, or for starting in the house, pots may be used quite successfully. Some growers using hotbeds prefer to sow the seed directly in the soil in the bed. Drills one-quarter to one-half of an inch deep are opened every four inches apart and the seed sown moderately thickly in these. The seeds are then covered with sifted soil, or rather sandy loam, that is pressed firmly on the seed.

CARE

The soil should be watered sufficiently at regular intervals to maintain moist conditions, but not to be excessively wet.

PRICKING OUT

When the young plants have developed their first pair of rough leaves above the seed leaves, they should be pricked out into flats, or in the hotbed, two by two inches apart each way.

TRANSPLANTING

For the proper development of the plants, they should be transplanted again as soon as they begin to crowd, giving them space equal to four by four inches apart. The final transplanting should allow six by six inches apart, or set in four to six-inch pots. Blocking out with a spade is a common practice where the crop is to be used for canning. The plants are grown six by six inches apart in the hotbed or cold frame and, a week before they are to be planted out in the field, the soil between the rows of plants is cut with a sharp spade, so as to form a square of soil about each plant, thus making it easy to remove the plants from the bed with a close pronged fork or spade at planting time. Strawberry boxes filled with earth and placed in the hotbed have been found to provide a desirable type of container. The aim of the grower should be to produce good stocky plants, and to do this, plenty of space should be allowed in the hotbed. Crowded conditions tend to produce long leggy undesirable plants.

HARDENING OFF

It is very desirable to expose the plants gradually to outside conditions for at least a week or ten days before planting in the field. By degrees, more air should be given, lifting the sash during the daytime and each day increasing the air until the sashes are completely removed and left off entirely. Treated thus, the plants when set out in the field should not check so severely, if at all, should cool night temperatures be experienced.

SOIL AND ITS PREPARATION

The tomato crop will be found to do best on a warm, quick soil, such as a sandy loam or light friable clay loam. Availability of plant food is important, but the supply should be in proportion to the needs of the plants. Nitrogen in a limited, but available form, in the early part of the season, will help the plants to develop healthy wood, but, if in excess of actual requirements, will produce soft wood growth, and particularly if available during the whole season. Phosphoric acid and potash should be plentiful since the setting, development and ripening of the fruit depends to a large degree upon these two elements. It is, therefore, advisable to have a properly balanced condition in the soil. If the tomato crop follows after some hoed crop for which the land

was manured the previous season, good results should be obtained. In some sections, the tomato crop is grown after a clover sod, which makes a very satisfactory rotation. Thorough preparation of the land is very essential for the tomato crop.

TIME TO PLANT

Since the tomato is a tender plant, it is not set out until danger of late frost is past, which is, as a rule, shortly after the middle of May, in the warmer sections, to the tenth of June, in those regions where late frosts occur.

DISTANCE OF PLANTING

For field culture, the plants should be set four to five feet apart each way, which will allow ample space for them to develop. In the case of the early maturing varieties, the distance apart in the rows may be reduced, since they do not spread as much as do the later maturing sorts. For staked tomatoes, the rows should be four feet apart, with the plants two feet apart in the rows.

PLANTING

It is important, when removing the plants from the hotbed or cold frame to the field, to disturb the root system as little as possible. Plants that are carefully handled will not receive quite so severe a check and will become established and continue growth much more quickly than plants that have been carelessly handled. Early maturity of the fruit depends to a large measure upon the care the plants get at planting time. Pot or strawberry box grown plants have been found to check less than those lifted directly from a hotbed or cold frame. Plants that have become drawn or leggy may be used successfully if layered, the holes to receive the plants being prepared in the usual way, except that a short trench is made at one side to allow the plants to be laid down, thus the roots and stem may be covered with soil, leaving about nine inches of the top growth exposed. By planting in this way, the plants will not be subject to damage by wind. In regions where late frosts occur, it is a very desirable way to handle the plants. Should the tops be severely frozen, by uncovering a portion of the covered stem, new growth will develop and rapidly form a new top. It has also been found that, where the stem of a tomato plant has been covered with soil, new roots will develop along the entire length. Mounding up with soil around the plants has been found to give support to the plants against heavy wind, and to a degree against frost. Where the prevailing winds are liable to do damage, by setting the plants in a sloping position so that they will slope with the direction of the wind, a great deal of loss may be avoided. Under field conditions, training is not practised, as a rule, but should rank growth develop, due to the presence of excessive fertility or moisture, it is found effective to turn the plants over to check the growth. This is not desirable since severe damage may result.

STAKING

Training the plants to one or two stems on stakes has been found an advantage in the home garden, and also in commercial production. Stakes five feet long and about one and one-half inches square will be found very satisfactory. Steel rods are also very satisfactory. These should be five feet long and three-eighths of an inch in diameter. The cost is quite reasonable since the life of these stakes is much longer than that of wood. A wire trellis may be constructed, having the wires spaced nine to twelve inches apart. As soon as the plants are set out, one or two stems should be tied with soft twine or raffia to the stakes or wires, and all lateral growth or branches developing from

the axils of the leaves, should be pinched out. This has been found to produce very symmetrical, smooth, clean fruit, and in sections of Western Canada, or where the nights are cool in summer, the tomatoes have been found to ripen sooner than where the plants were allowed to grow on the ground. Another method that has been found advantageous in the higher altitudes in British Columbia, is to set the plants in rows two and one-half feet apart, with the plants one foot apart in the rows. Tying to stakes is resorted to and the plants are allowed to set from two to three trusses of fruit, after which, all new growth is kept removed.

In sections where it is difficult to get a quantity of ripened fruit, it may be found necessary to pull the crop before it is frozen. Fruits that have developed colour can be pulled and successfully ripened in the house, or the entire plants may be pulled and hung up indoors in a dark room, where it is moderately warm, and where a large amount of the fruit will ripen quite well.

CULTIVATION

As soon as possible after planting, the cultivator should be started so as to maintain a soil mulch and to control weeds. The advantage of having the plants set carefully in squares allows for the use of the horse cultivator in both directions, thus reducing the amount of hand hoeing. While cultivation is important, great care should be taken to avoid damage to the root system. Deep cultivation may be given at first, but as the season advances, the depth of cultivation should become shallower and confined chiefly to the centre of the rows. When hoeing, it is a good plan to bring a little soil up to the stems of the plants as this will give the plants considerable support.

CUTWORMS

An effective control has been found for cutworms by spreading moist, poisoned bran mash around the plants after sundown. Since cutworms are night feeders, it is important to have the mash freshly spread, and in an attractive condition during the night time. The worms will take this bait and die. Make the mash as follows, 50 pounds bran, $\frac{1}{2}$ pound white arsenic or 1 pound Paris Green. Mix these thoroughly together, then add water enough to make a moist mash, and add one pint of cheap molasses to sweeten the bait.

FLEA-BEETLES

During some seasons, flea-beetles are quite troublesome. The plants can be quite effectively protected by spraying with 4-4-40 Bordeaux mixture which will act as a repellent. Spraying should be started while the plants are in the cold frame and be continued at intervals of ten days so as to have the foliage completely covered.

DISEASES

There are a number of diseases common to the tomato that can be controlled to a considerable extent.

Septoria Leaf Spot—(*Septoria lycopersici*).—A very common disease that usually makes its appearance during the midseason. Water-soaked spots appear in the centre of the lower leaves on the under side, developing quite rapidly under moist, warm conditions, and causing the whole leaf system to dry up and fall off. The disease spreads upwards. The crop will be greatly reduced, due to premature ripening and sunscald. Spraying with 4-4-40 Bordeaux mixture has been found the most effective control. The spraying should be started early enough in the season to prevent infection. Shortly after the plants have

been set in the field is the proper time to apply the first spray, giving three to five applications at intervals of ten days apart. After the crop has been harvested, the old vines and leaves should be burned or ploughed in deeply, and a rotation practised.

Late Blight (Phytophthora infestans).—There is a different strain of this disease that causes the late blight of potatoes. During cool, moist weather, or towards the end of the season, this disease sometimes makes its appearance, causing numerous dark spots on the leaves and stems. If the weather is moist, the disease rapidly spreads, killing the leaves and whole plant. The disease also affects the fruits, causing bruised-like spots. Spraying thoroughly with Bordeaux mixture has been found to be the most effective control.

Blossom End Rot.—This is a physiological disease of widespread occurrence. The first stages occur on both green and ripening fruit, causing an irregular brown patch at the blossom end. It frequently occurs where plants have made strong, soft growth early in the season, and are subjected to dry conditions later on. The control recommendations are limited plant growth, with an adequate even moisture supply, coupled with a surface mulch of straw to maintain moist soil conditions. There is also the possibility of selecting a disease-resistant strain.

Mosaic.—This disease makes its presence known by the mottling of the leaves with light and dark green spots which are frequently associated with distortion of the foliage, and stunting of the plants. The disease can be spread from one plant to another by insects, by rubbing with the hands, or by the juice of a diseased plant being introduced into a healthy one through an abrasion on the stem or leaf.

This disease is not carried over in the seed, nor does it winter over in the soil, but is carried over by perennial weeds which act as a host to it. All infected plants should be destroyed as soon as found, so as to prevent the disease from spreading.

TOMATO CULTURE UNDER GLASS

The following section dealing with tomatoes under glass, is taken from pamphlet No. 10, by Mr. W. T. Macoun, Dominion Horticulturist.

It is being found quite profitable in Canada to grow tomatoes under glass. Moreover, persons having small greenhouses and who are fond of tomatoes can readily grow a few plants and have enough fruit for home use in this way when there is none outside.

The best and most profitable time to have ripe tomatoes in the greenhouse is during the months of November and December, and the months of April, May, and June. By sowing the seed in good time in the summer the main part of the crop will be set before the days become very short and before the weather becomes very cold and prevents the thorough ventilation and dry atmosphere which are desirable to ensure a good distribution of pollen and a good set of fruit. The spring crop, on the other hand, should come on as late as possible so that there will be a minimum amount of fuel used. It has not been found profitable to have tomatoes ripen in midwinter, as on account of the poor light at blooming time, the conditions are unfavourable. Tomatoes should have abundant sunlight and there should be means of good ventilation. Each cropping season covers between two and three months.

If it is desired to have ripe tomatoes in November and December, seed should be sown the first week of July. For a crop in April, May, and June, seed should be sown the first week of November or late in October. The seed is sown as if plants were to be grown outside and the young plants are pricked

out into flats three by three inches apart as soon as the first rough or true leaf appears. The young plants should be carefully watered so as to keep them thrifty. In about three weeks or less they should be transplanted to three and a half or four-inch pots, in which they remain until they are needed for planting in the bed. They should be ready for planting in about eight weeks from the time the seed is sown. If it is known in good time that the greenhouse will not be ready to receive the plants before they are liable to become pot-bound or stunted in the pots, it is desirable to transplant them into larger pots, as it is important to keep them growing. Some growers make two or three successive sowings of seed at intervals of two weeks, and, in case they have not gauged the time of the first sowing accurately, they use the plants from the second or third. The rapidity of growth depends very much on the kind of weather and ventilation given; thus, the plants for the spring crop are usually longer in reaching the desired size for planting in the bed, which is just before the first flowers open, ten weeks being about an average time from the date of seeding. The best temperature for tomatoes is about 75° F. in the daytime, though it may run to 85° F., but if it continues high the plants will be too soft and liable to disease, hence it should be kept as near 75° F. as possible. When the plants are young the temperature should be lower than during the fruiting season—from 60° F. to 65° F. in the daytime being high enough. At night the temperature should not run above 65° F., nor below 60° F., during the fruiting season.

Tomatoes may be either grown on benches in the greenhouse or on the ground. If grown on benches they should have ample soil so that there is no danger of the roots becoming dry, and there should also be good drainage. Good drainage is also very necessary when the plants are in beds on the ground. There should be from six to eight inches of good, rich loamy soil, such soil as they would do well in outside. Soil from rotted sod is good. Two crops may be grown on the same soil, but for the second it is desirable to dig in some well-rotted manure. It has been found that 20 by 18 inches apart is a satisfactory distance to plant in narrow beds, but in wide beds it is desirable to have a two and a half foot space lengthwise between every four rows to let in light and afford a better circulation of air. Another plan would be to have the plants 24 inches apart east and west and 18 inches apart north and south. The soil should be kept constantly moist, but care should be taken not to water too much. The surface soil should be loosened from time to time. Provision must be made for staking the plants. A horizontal wire is necessary six or seven feet above each row of plants, and there are several methods by which the plants are trained up to it. The most permanent method is to have a piece of stiff, No. 10, wire for each plant. This is stuck into the soil beside each plant and fastened to the horizontal wire above, then as the plant grows it is tied to the wire with raffia. Another plan is to have a lath serve the purpose of the wire; and another is to have a low, horizontal wire as well as the one above and use heavy cord or binder twine to support the plant, tying the plant to the cord with raffia. All side shoots are pinched out as they appear, the plant being trained to one stem. When they have grown to the upper wire the tips are pinched off and kept off. When the plants bloom it is important to have the air of the greenhouse as dry as possible so that the pollen will be readily distributed, and good ventilation is desirable to keep the air dry. On dark days, particularly, the greenhouse is likely to be too damp unless well ventilated. Usually a good setting of fruit can be obtained off the autumn or early winter crop by tapping or slightly shaking the plants daily about midday, thus causing the pollen to be scattered and make it more certain of reaching all parts of the stigma, insuring both a better setting and more perfect fruit, as, if only part of the stigma receives pollen, the fruit will be one-sided or irregular. For the crop which blooms in winter, artificial pollination

is desirable, the pollen being dusted from one flower to another. A camel's hair brush to dust on the pollen which has been previously collected on a watch-glass, or on a rabbit's tail tied to a stick, with which the flowers are brushed, are good instruments for this purpose. A fair yield per plant under glass in Canada is 3 to 5 pounds, although the yield may be considerably lower if the fruit sets badly, or it may be somewhat higher. Tomatoes grown in twelve inch pots in the greenhouse give good results. The soil and drainage should, however, be good. Grown in this way, the pots can be moved before the crop is quite over, making the space available for something else.

The varieties most generally grown under glass in Eastern Canada are Bonny Best and Livingston Globe, the latter being purplish-pink in colour, smooth and very solid, making it a good shipper. It does not ripen as soon as some others, but it is one of the best yielders in the long run. The scarlet varieties which have given good results at the Central Farm are Grand Rapids, Bonny Best, Industry and Sutton Satisfaction, smooth sorts with firm flesh and good quality. Kondine Red is the most popular variety in British Columbia.

There are several diseases which affect the tomato when grown under glass, and, as they are difficult to control, it is desirable, by good ventilation and proper attention to temperature, to avoid having them.

As the white fly is sometimes very troublesome in greenhouses, it is necessary to control it, when present, if one is to have good success in growing tomatoes, and there is nothing so satisfactory as hydrocyanic acid gas for this purpose. This gas is, however, a deadly poison and great care must be taken in using it. Following is a formula found to be effective in killing the flies without injury to the plants. As the eggs are not destroyed, it is necessary to fumigate at intervals in order to keep the insects under control.

Fumigating Greenhouse With Hydrocyanic Acid Gas

Formula: $\frac{1}{6}$ to $\frac{1}{4}$ ounce calcium cyanide to 1,000 cubic feet of greenhouse space. Make the greenhouse as nearly air tight as possible. There should be no moisture on the leaves. It is desirable to not water for about twenty-four hours before fumigating. While fumigating, the temperature should be between 55° F. and 70° F., and, to prevent moisture on the foliage, it is better to have the temperature rising rather than falling. It is preferable to choose a calm night so that there will be the least change of air in the house. While the walks need not be perfectly dry, there should not be any water lying on them.

The best time to fumigate is in the evening after it is dark, and the calcium cyanide is sprinkled evenly over all or part of the walks from one end of the house to the other.

The gas is given slowly off the calcium cyanide, which makes it not so dangerous to use as the sodium cyanide or potassium cyanide, but, as hydrocyanic gas, which is the gas given off, is a deadly poison, the greenhouse should be kept locked and no one allowed to enter until morning, by which time the gas will be practically all gone.

As there is danger of injuring the plants if large doses are given, it is better to start with a small dose and gradually work up to a larger one if the first does not kill the insects. The size of the necessary dose depends so much on the tightness of the greenhouse that different doses are necessary for different greenhouses. If the dose recommended here, which is that found most satisfactory for a very tight house, does not kill the flies, another dose, a little stronger, should be given in a few days. In any case, it is desirable to give two or three fumigations at intervals of about two weeks to get entirely rid of the flies as eggs continue to hatch after the first fumigation.